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ALEXANDRIA FIELD OFFICE MARCH 1984

BIOLOGICAL EVALUATION OF SOUTHERN PINE BEETLE ON THE ANGELINA, YELLOWPINE, NECHES, TRINITY SAN JACINTO AND RAVEN RANGER DISTRICTS ON THE NATIONAL FORESTS IN TEXAS

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by

Forrest L. Oliveria[1/]

Abstract

A biological evaluation of southern pine beetle (SPB) infestations was conducted on the Angelina, Yellowpine, Neches, Trinity, San Jacinto and Raven Ranger Districts on the National Forests in Texas. During August 1983, these districts had 395 active SPB spots; 538,147 acres of susceptible host type and a cumulative average of 0.73 SPB spots/1000 acres of susceptible host type in the outbreak area. Forest Pest Management recommends that actively expanding spots be evaluated on a spot-by-spot basis to determine the method of control (if any) and that a SPB suppression project be initiated for FY 84 for these districts.

INTRODUCTION

A biological evaluation was conducted on the National Forests in Texas (Figure 1) to determine the status of southern pine beetle (Dendroctonus frontalis Zimm) populations. The following Ranger Districts were evaluated; Angelina, Yellowpine, Neches, Trinity, San Jacinto, and Raven Ranger Districts. Entomologists from Forest Pest Management (FPM), Pineville, LA, Field Office conducted the evaluation on July 20, 1983 through August 18, 1983.

Southern pine beetle (SPB) infestations have been occurring on the National Forests in Texas since the early 1960's. Subsequently, populations have fluctuated between endemic and epidemic levels on various districts. In 1983 there was an increase in the number of SPB infestations on the National Forests in Texas. The winter of 1982-83 was very mild and permitted the SPB to continue rapid brood development throughout the entire winter months. The spring was warm and wet in 1983 which continued to favor the development of SPB

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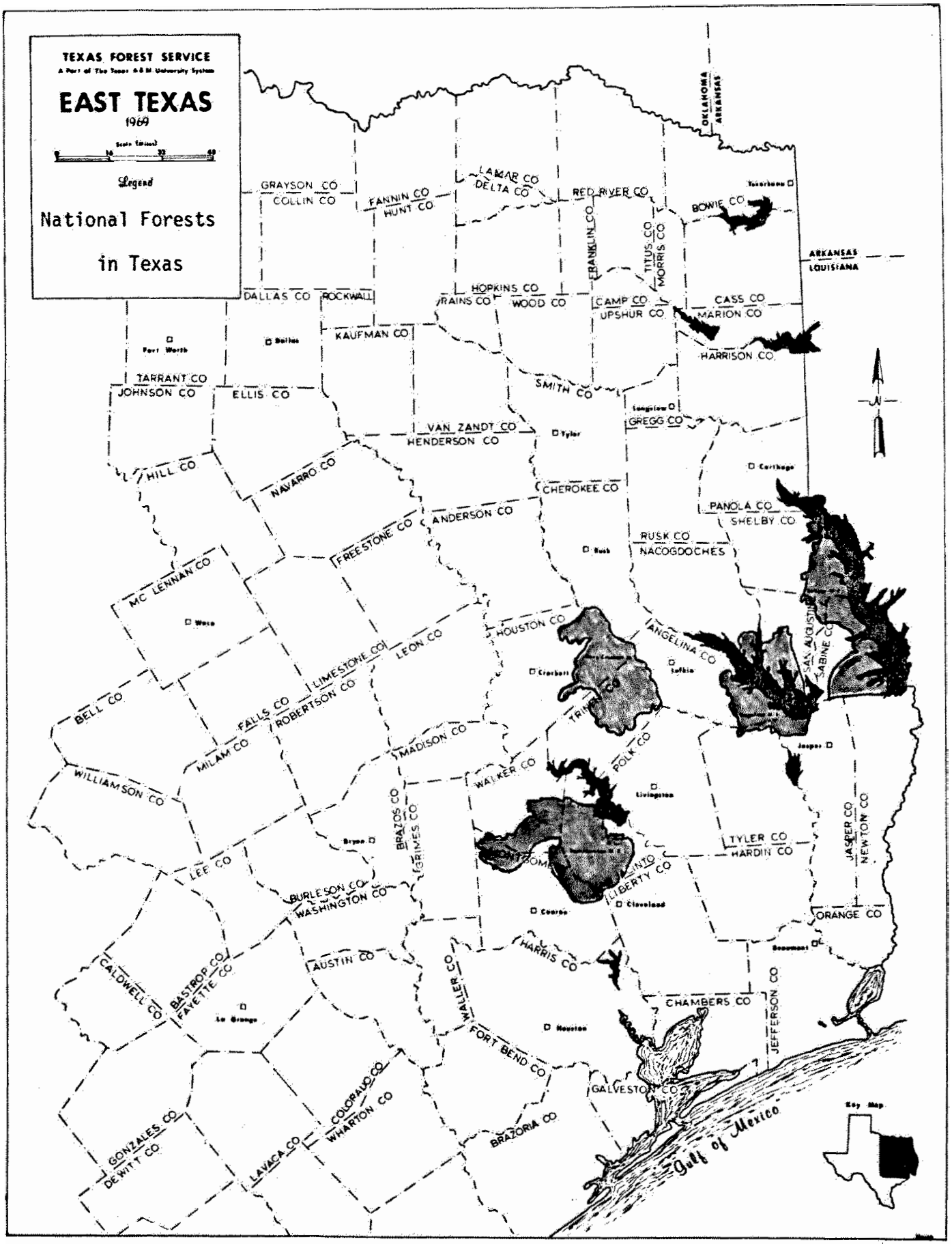

Figure 1. Location of the National Forests in Texas.

brood. During August 1983 the entire area was damaged by high winds from hurricane Alicia. The combination of an abundance of leaning and/or root stressed trees, heavy rains, and favorable weather conditions has allowed the SPB population to explode to epidemic levels.

During FY 1983, the Four Notch and Chambers Ferry Further Study Areas, and the Yellowpine Ranger District had SPB suppression projects. The Four Notch is located on the Raven Ranger District of the Sam Houston National Forest. Chambers Ferry is located on the Tenaha Ranger District of the Sabine National Forest. The Yellowpine Ranger District is also part of the Sabine National Forest. These districts have had an aggressive salvage program, but the SPB have been so vigorous that the populations are still expanding.

TECHNICAL INFORMATION

The southern pine beetle is one of the most destructive insect enemies in the South. It attacks all species of southern pines. On the National Forests in Texas, loblolly pine, Pinus taeda L., and shortleaf pine, Pinus echinata Mill. are preferred hosts. Typically, pines are killed in groups ranging from a few trees to those covering several hundred or even thousands of acres.

Life Cycle of the Insect

Beetle broods complete their development in about a month from April through September (approx. 7 generations/year). The adult beetles attack living trees, sometimes thousands of beetles invade individual trees. Each pair of attacking beetles constructs a winding gallery in the inner bark and the female deposits eggs in niches along the sides. The galleries meet and cross one another and girdle the tree.

The eggs hatch into a whitish crescent-shaped larva with a glossy, reddish-brown head. The larvae mine in the inner bark and the corky bark. When fully grown they pupate just below the surface of the corky outer bark.

When pupation is complete the new adults chew exit holes through the bark and invade green trees in the vicinity or fly considerable distances to begin new infestations. A complete description of the biology of the southern pine beetle is available in "Forest Insect and Disease Leaflet 49".

Type of Damage

Damage caused by the southern pine beetle is tree mortality resulting from adult beetles constructing egg galleries in the cambial region of the host tree. Blue staining fungi (Ceratocystis spp.) introduced by the beetles and secondary insects may accelerate tree death by blocking the vascular system of the tree.

METHOD OF EVALUATION AND ANALYSIS OF SPB INFESTATIONS

Aerial Survey and Ground Check

Standard aerial sketch map procedures were used for this evaluation, except survey coverage was 100%. Aerial surveys were conducted by district personnel prior to ground checking and spots of red and/or fading trees were recorded and plotted on Forest Service Class A maps. Fifty-six spots were randomly selected for ground checking.

Numbers of vacated and infested trees, crown color, brood stage, basal area, age, height, DBH, percentage of the stand in sawtimber, and landform were recorded. This information was used to run the benefit/cost analysis and to hazard rate the stands.

Hazard Rating

All the SPB infested stands were hazard rated at the time of ground checking. This is part of FPM's effort to validate SPB hazard rating systems whenever the opportunity exists. The system used was developed on the Kisatchie National Forest by Dr. Peter Lorio of the Southern Forest Experiment Station (Lorio and Sommers 1981). It is designed for use by the National Forests in Region 8 and utilizes field data collected by the prescriptionist during the field procedure (FSH 2409.21d R8 Kisatchie National Forest Supplement No. 7). Due to the similar nature of the forest conditions between central Louisiana and east Texas, we feel that this hazard rating system should accurately reflect host/site/stand characteristics associated with SPB attack on the National Forests in Texas.

Suppression Project Criteria

Decisions to initiate a SPB suppression project were based on the following criteria:

- Number of SPB spots per 1,000 acres of susceptible host type.

  This figure provides an indication of current levels of SPB activity. One multiple tree spot/1000 acres of susceptible host type has historically been considered the lower threshold of a SPB epidemic. To determine the number of acres of susceptible host type, the Continuous Inventory of Stand Conditions (CISC) data for the National Forests in Texas was used. The number of acres of shortleaf-oak, loblolly-hardwood, longleaf, slash, loblolly, shortleaf, and bottomland hardwood-yellow pine were determined (forest type codes 12, 13, 21, 22, 31, 32 and 46). Regeneration, seedling-sapling and sparse stand acreage was subtracted from the total as these areas have little chance of sustaining large losses to SPB.

- Green tree:red tree ratio

  This ratio, based on the number of green infested trees to the number of red and fading infested trees, provides an indication of how rapidly a SPB spot is expanding at the time of ground check.

- Volume of timber currently infested and economic evaluation

  The volume of timber currently infested is calculated from the ground checked SPB spots. The currently infested volume is used in the Southern Pine Beetle Economic Evaluation Program (SPBEEP) to develop the economic benefit cost ratio, internal rate of return, targets for timber removed, and the volume of timber protected by control efforts. As the volume of timber currently infested with SPB increases, the economic benefits from a SPB suppression project also increase.

- Entomological judgment

  Professional experience and field observations from the ground checked spots are used to interpret and supplement the technical data to reach a final decision.

RESULTS AND DISCUSSION

A total of 395 active multiple tree SPB infestations were recorded during the aerial surveys. Fifty-six spots were ground checked by FPM during the evaluation and the data are summarized in tables 1-12. The groundchecked spots ranged in size from 2-666 trees and the mean ratio of green infested:red infested trees was 4.15:1. Most of the spots were expanding and contained many trees with fresh attacks. Figures 2-7 show the areas of heaviest SPB activity. There was a total of 538,147 acres of susceptible host type for the six districts of the National Forests in Texas which were evaluated. There was a mean of .73 spots/1000 acres of susceptible host type.

Trend

Of the 56 active SPB spots ground checked, 39 were predicted to have additional timber loss during the next 30 day period (Tables 1-6). The range in predicted spot growth was 0-372 trees.

The National Forest in Texas had a very mild winter in 1982-83 and a warm spring. These climatic factors combined with the mature and over-mature timber on many of the national forest stands contributed to the epidemic of SPB that the national forests are experiencing.

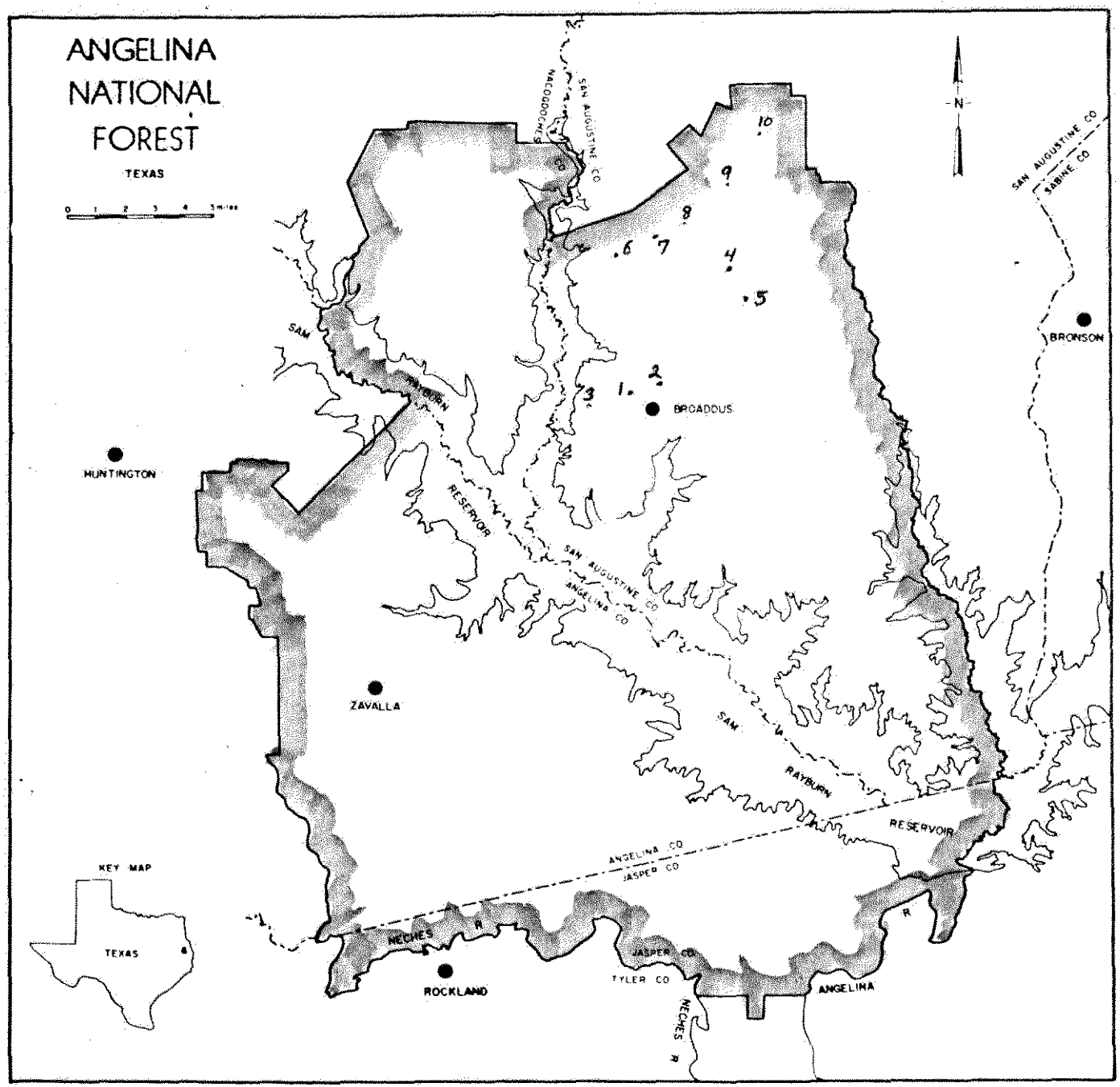

Figure 2. Location of sampled SPB spots on the Angelina Ranger District of the Angelina National Forest.

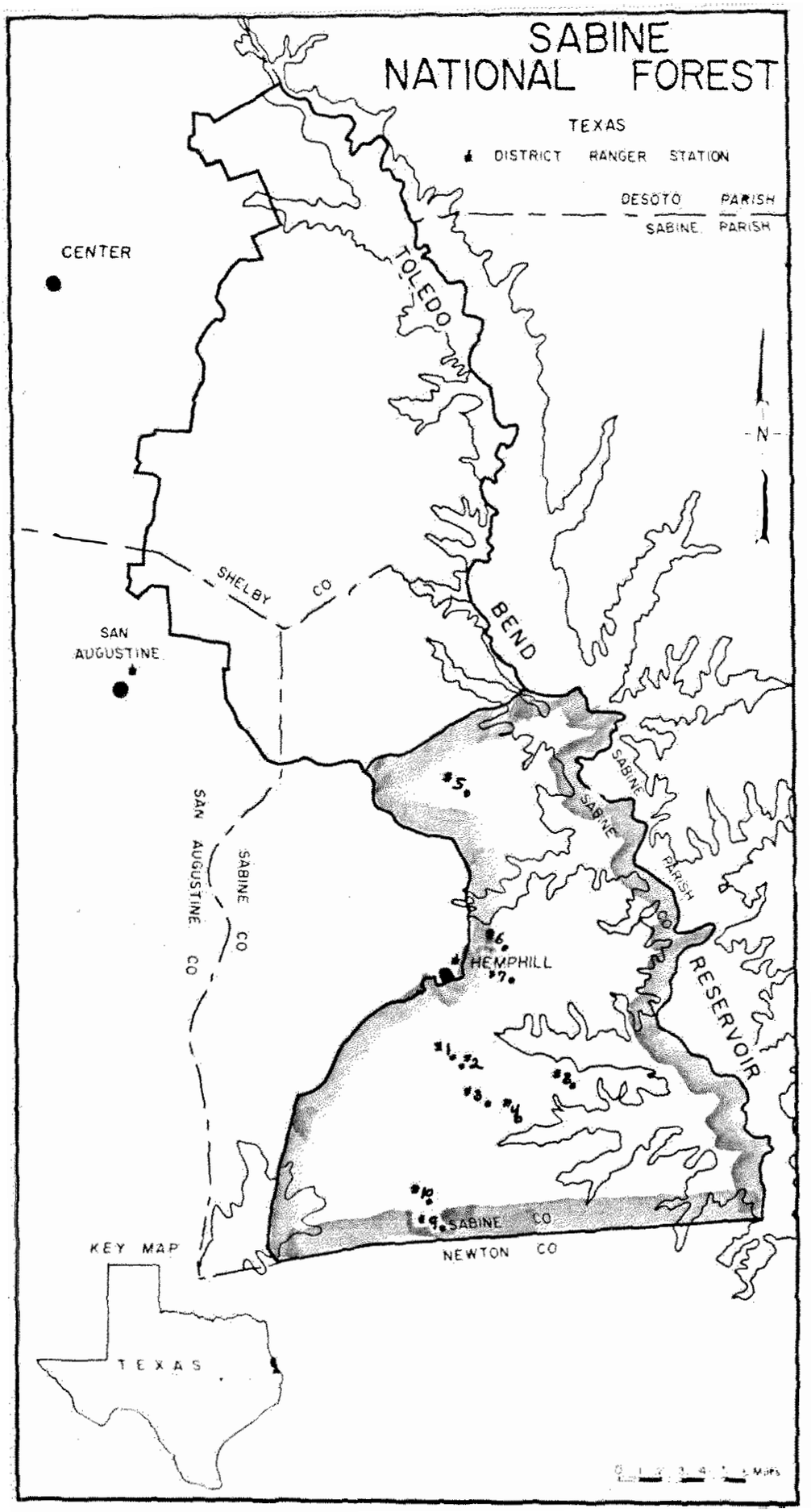

Figure 3. Location of sampled SPB spots on the Yellowpine Ranger District of the Sabine National Forest.

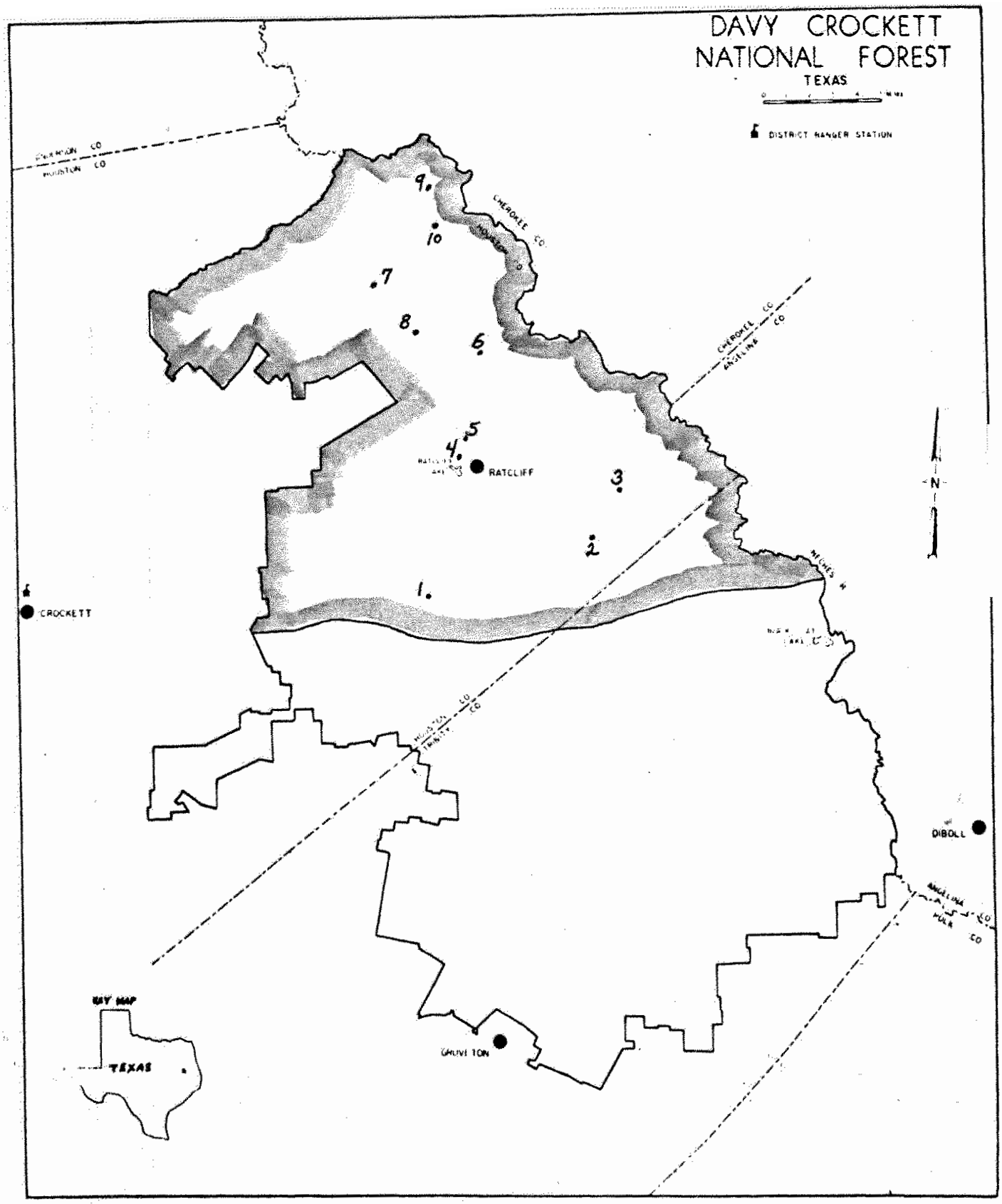

Figure 4. Location of sampled SPB spots on the Neches Ranger District of the Davy Crockett National Forest.

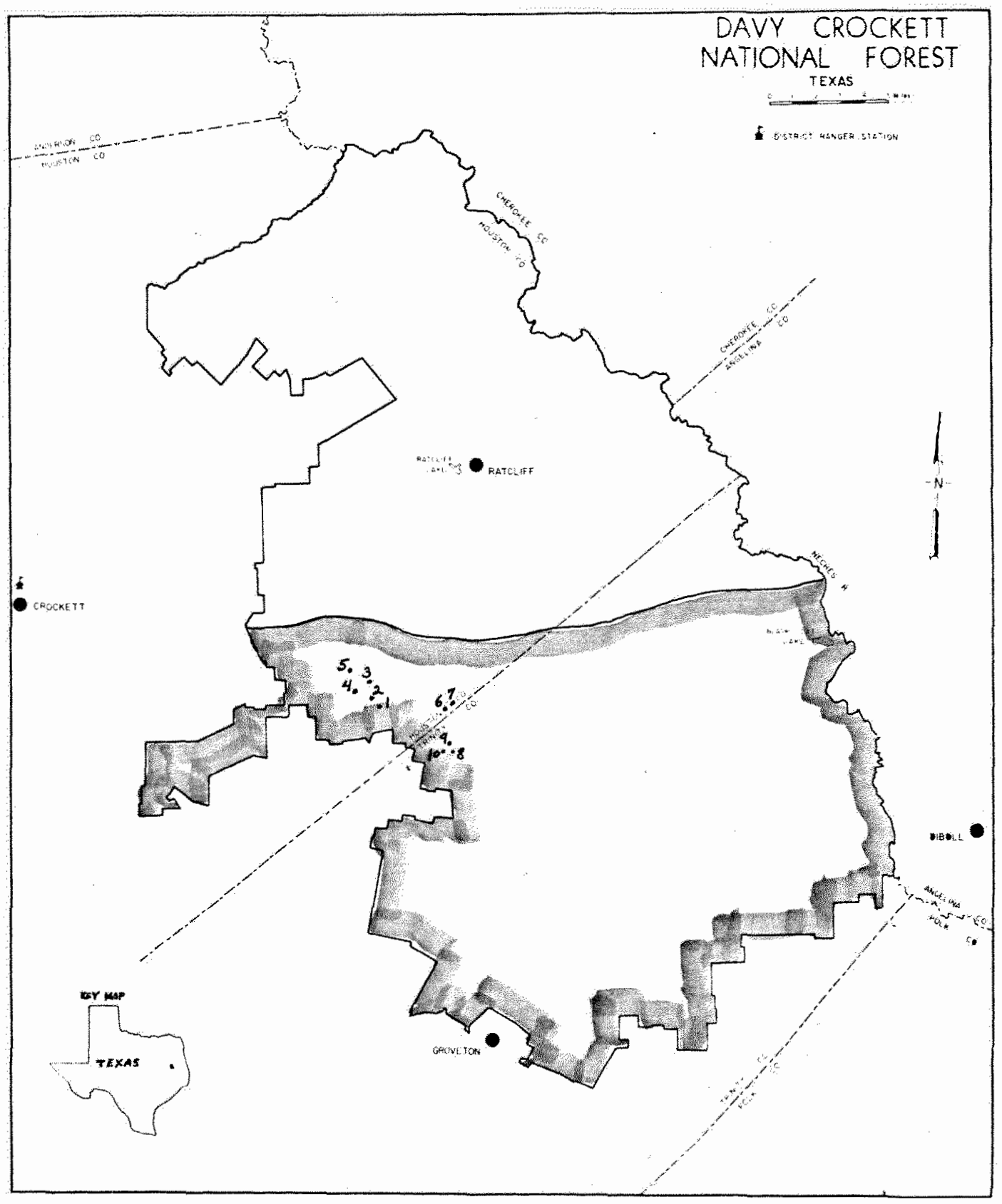

Figure 5. Location of sampled SPB spots on the Trinity Ranger District of the Davy Crockett National Forest.

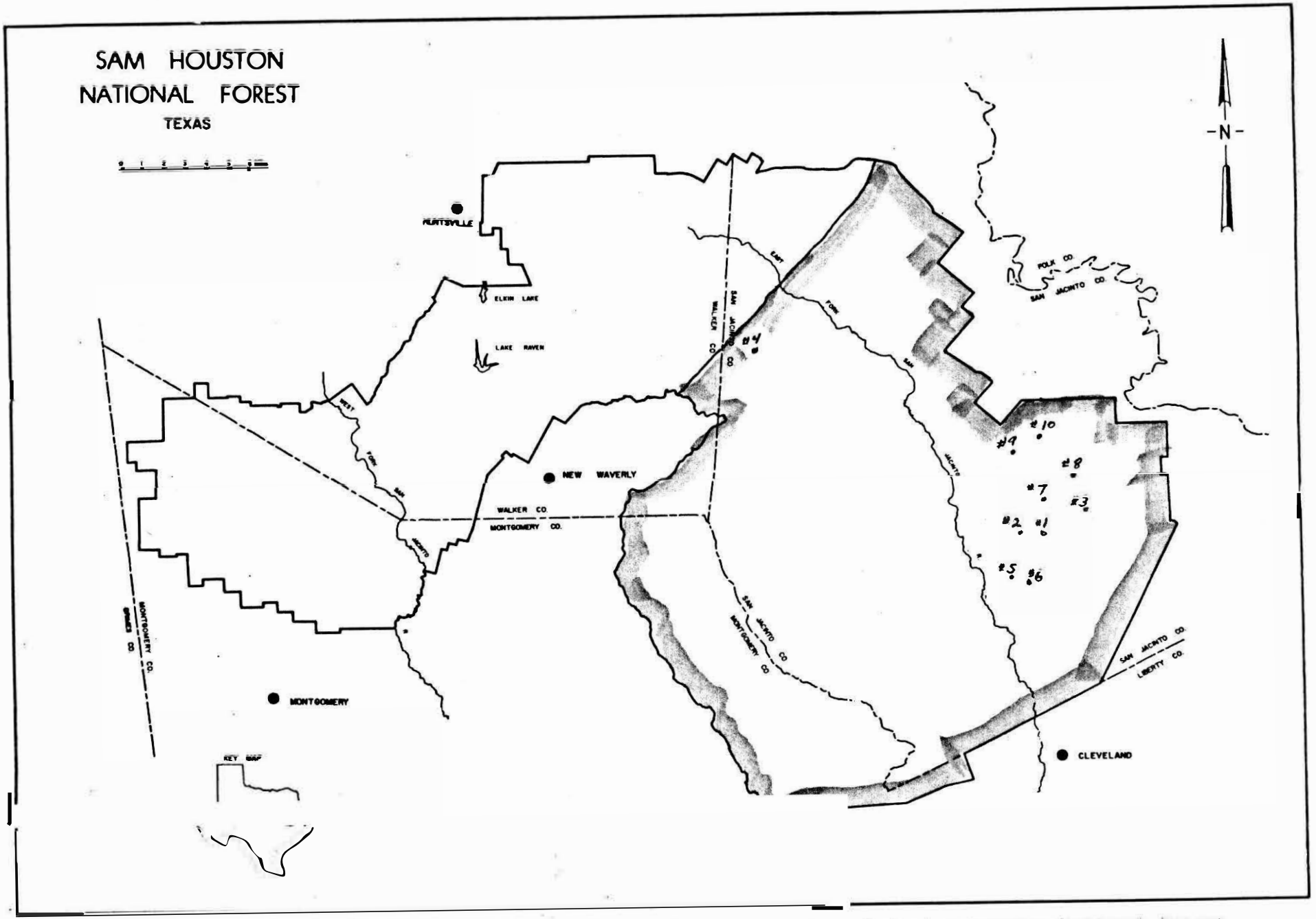

Figure 6. Location of sampled SPB spots on the San Jacinto Ranger Distric of the Sam Houston National Forest.

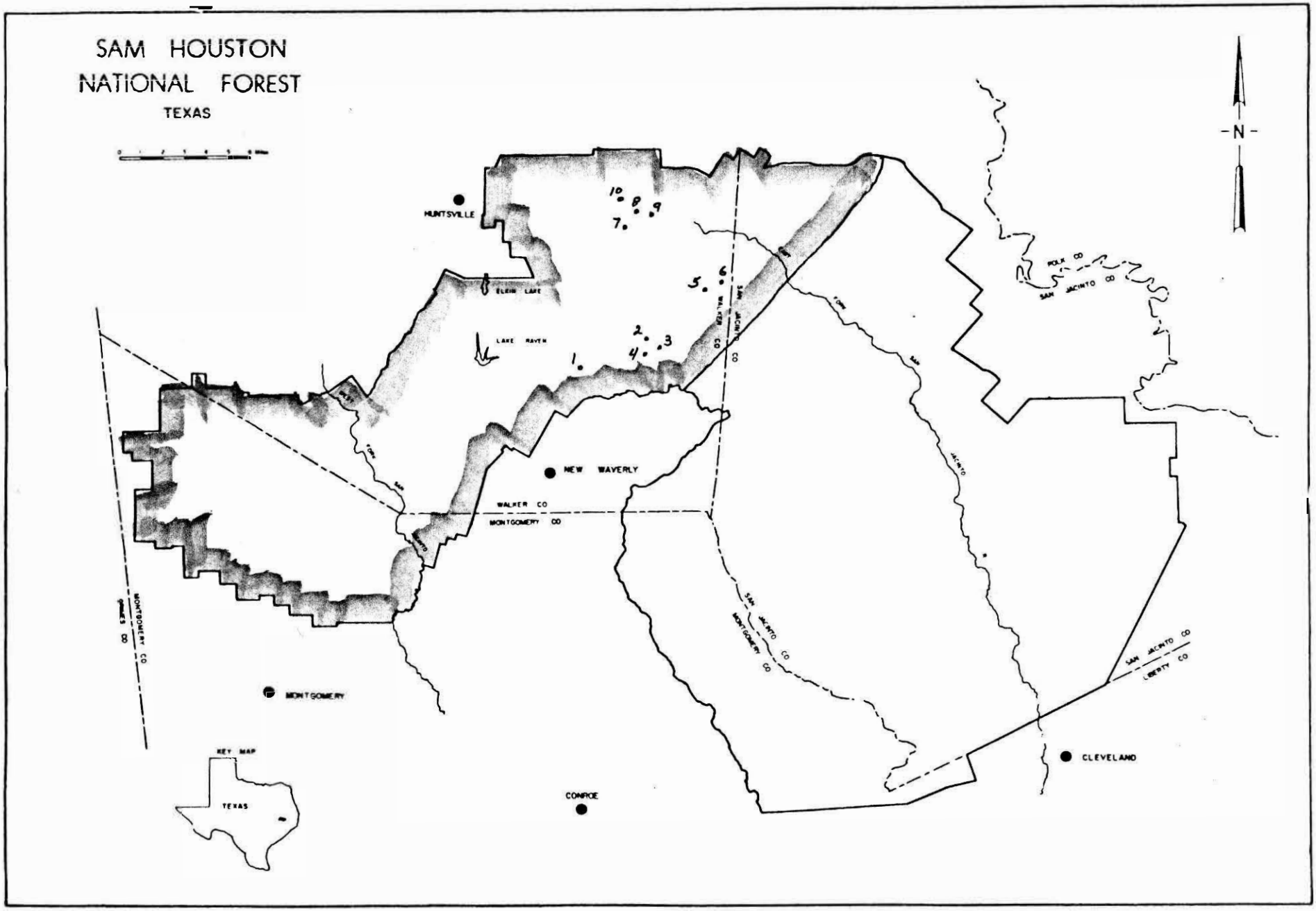

Figure 7. Location of sampled SPB spots on the Raven Ranger District of the Sam Houston National Forest.

Table 1. Summary of ground check data for the Angelina Ranger District, Angelina National Forest, National Forests in Texas.

Spot No.	Total No. Trees	No. Infested Trees			Total No. Vacated Trees	% Infested	Green:Red Ratio[a/]	Total Basal Area	Additional Spot Growth Loss[b/]
		Total	Green	Red					
1	9	6	0	6	3	67	0.00	150	0
2	94	80	74	6	14	85	12.33	110	47
3	11	9	5	4	2	82	1.25	150	2
4	19	12	9	3	7	63	3.00	150	4
5	10	2	1	1	8	20	1.00	130	0
6	31	16	16	0	15	52	16.00	160	9
7	32	7	6	1	25	22	6.00	80	0
Total	206	132	111	21	74			930	62
x̄	29.4	18.9	15.9	3	10.6	84	5.29	132.9	7.75

a/ Based on infested trees only.

b/ Additional number of trees lost over 30 days during summer months calculated using Billings and Hynum, 1980.

Table 2. Summary of ground check data for the Yellowpine Ranger District of the Sabine National Forest, National Forests in Texas.

Spot No.	Total No. Trees	No. Infested Trees			Total No. Vacated Trees	% Infested	Green:Red Ratio[a/]	Total Basal Area	Additional Spot Growth Loss[b/]
		Total	Green	Red					
1	63	34	26	8	29	54	3.25	90	12
2	53	29	28	1	24	55	28.00	60	4
3	127	91	87	4	36	72	21.75	140	71
4	31	23	22	1	8	74	22.00	120	10
5	49	24	21	3	25	49	7.00	120	11
6	130	91	86	5	39	70	17.20	110	54
7	65	34	25	9	31	52	2.78	60	6
8	57	46	40	6	11	81	6.67	150	35
9	128	99	58	41	29	77	1.41	130	71
10	37	7	3	4	30	19	.75	120	0
Total	740	478	396	82	262			1100	274
x	74	47.8	39.6	8.2	26.2	65	4.83	110	27.4

[a/] Based on infested trees only.

[b/] Additional number of trees lost over 30 days during summer months calculated using Billings and Hynum, 1980.

Table 3. Summary of ground check data for the Neches Ranger District of the Davy Crockett National Forest, National Forests in Texas.

Spot No.	Total No. Trees	No. Infested Trees			Total No. Vacated Trees	% Infested	Green:Red Ratio[a/]	Total Basal Area	Additional Spot Growth Loss[b/]
		Total	Green	Red					
1	206	158	134	24	48	77	5.58	150	137
2	89	80	66	14	9	90	4.71	140	61
3	73	45	30	15	28	62	2.00	130	29
4	5	1	0	1	4	20	0.00	120	0
5	10	4	0	4	6	40	0.00	100	0
6	36	28	25	3	8	78	8.33	150	19
7	31	11	9	2	20	35	4.50	130	2
8	2	2	0	2	0	100	0.00	110	0
9	47	32	17	15	15	68	1.13	120	17
Total	499	361	281	80	138			1150	265
$\bar{x}$	55.44	40.11	31.22	8.88	15.33	72	3.51	127.7	29.44

[a/] Based on infested trees only.

[b/] Additional number of trees lost over 30 days during summer months calculated using Billings and Hynum, 1980.

Table 4. Summary of ground check data for the Trinity Ranger District of the Davy Crockett National Forest, National Forests in Texas.

Spot No.	Total No. Trees	No. Infested Trees			Total No. Vacated Trees	% Infested	Green:Red Ratio[a]	Total Basal Area	Additional Spot Growth Loss[b]
		Total	Green	Red					
1	29	17	10	7	12	59	1.43	110	5
2	18	11	2	9	7	61	0.22	120	1
3	24	9	0	9	15	38	0.00	140	1
4	24	9	7	2	15	38	3.50	140	1
5	255	186	113	73	69	73	1.55	150	162
6	14	11	5	6	3	79	0.83	160	4
7	4	3	1	2	1	75	0.50	150	0
8	6	4	1	3	2	67	0.33	140	0
9	11	11	8	3	0	100	2.67	150	3
10	6	3	2	1	3	50	2.00	100	0
Total	391	264	149	115	127			1360	177
x̄	39.1	26.4	14.9	11.5	12.7	56	1.30	136	17.7

a/ Based on infested trees only.

b/ Additional number of trees lost over 30 days during summer months calculated using Billings and Hynum, 1980.

Table 5. Summary of ground check data for the San Jacinto Ranger District of the Sam Houston National Forest, National Forests in Texas.

Spot No.	Total No. Trees	No. Infested Trees			Total No. Vacated Trees	% Infested	Green:Red Ratio[a]	Total Basal Area	Additional Spot Growth Loss[b]
		Total	Green	Red					
1	261	168	150	18	93	64	8.33:1	90	85
2	150	100	100	0	50	67	100:1	120	66
3	15	9	3	6	6	60	.50:1	130	0
4	48	41	33	8	7	85	4.13:1	190	41
5	7	2	1	1	5	29	1	90	0
6	23	14	12	2	9	61	6.00:1	150	6
7	46	38	31	7	8	83	4.43:1	160	30
8	17	7	2	5	10	41	.40:1	130	0
9	4	3	3		1	75	3:1	160	
10	48	42	35	7	6	88	5.00:1	140	29
Total	619	424	370	54	195			1360	257
x	61.9	42.4	37	6	19.5	68	6.17	136	25.7

a/ Based on infested trees only.

b/ Additional number of trees lost over 30 days during summer months calculated using Billings and Hynum, 1980.

Table 6. Summary of ground check data for the Raven Ranger District of the Sam Houston National Forest, National Forests in Texas.

Spot No.	Total No. Trees	No. Infested Trees			Total No. Vacated Trees	% Infested	Green:Red Ratio[a/]	Total Basal Area	Additional Spot Growth Loss[b/]
		Total	Green	Red					
1	133	77	69	8	56	58	8.63	140	59
2	56	39	29	10	17	70	2.90	140	26
3	8	6	4	2	2	75	2.00	160	0
4	80	50	30	20	30	63	1.50	160	42
5	64	38	15	23	26	59	0.65	120	21
6	666	416	169	247	250	62	0.68	150	372
7	90	55	42	13	35	61	3.28	150	43
8	121	83	72	11	38	69	6.55	160	74
9	7	5	0	5	2	71	0.00	130	0
10	25	3	2	1	22	12	2.00	150	0
Total	1250	772	432	340	478			1460	637
x	125	77.2	43.2	34	47.8	62	1.27	146	63.7

a/ Based on infested trees only.

b/ Additional number of trees lost over 30 days during summer months calculated using Billings and Hynum, 1980.

Although there has been 4 or 5 days of weather below 32°F, an estimated 15-20% of the small and medium sized SPB larvae were killed. That was not enough mortality to cause any noticeable decrease in the SPB population.

The present SPB activity suggest that the SPB population will continue to increase this spring and summer at epidemic rates. This will be especially true in mature pine stands.

Economic Analysis

The estimated volume of trees currently infested in 18,353 MBF. If a SPB suppression project were undertaken, it is estimated that 19,271 MBF would be removed and 57,715 MBF would be protected. For detailed information on the economic benefits with and without a project, refer to Appendix I.

An intangible benefit that could not be included in the benefit/cost analysis is the potential loss of red cockaded woodpecker habitat. Stands in deferred areas on the National Forests in Texas are prime habitat for this endangered species and if SPB populations remain high for a long period of time much habitat would be destroyed. Our benefit/cost analysis does not include intangible benefits or cost in the calculations. The benefits reported here result from the reduced timber resource loss and the value of that protected and salvaged resource.

Hazard Rating

The stands were hazard rated (Tables 7-12) that contained each of the 56 ground checked infestations. Twenty-nine stands were in the high hazard classification, 17 in the medium classification and 10 in the low classificaiton. Lorio found on the Kisatchie National Forest that the majority of large infestations occurred in loblolly pine stands that were immature or mature sawtimber, well stocked, and on good sites (90 or better site index (Lorio and Sommers, 1981)). This holds true for the National Forests in Texas. Spots occurring in high hazard stands have the greatest potential for timber loss and when feasible, should be controlled first.

Table 7. SPB hazard rating summary for infestation locations on the Angelina Ranger District of the Angelina National Forest, National Forests in Texas.

Spot No.	Total Basal Area	Pine Basal Area	Total Tree Height	Site Index	Diameter (in.)	Age	Predominant Tree Species	SPB Hazard Rating[a/]
1	150	130	110	105	14	50	Slash	Medium
2	110	90	90	80	11	65	Shortleaf	Medium
3	150	90	110	103	12	60	Loblolly	Medium
4	150	110	120	112	20	60	Loblolly	High
5	130	70	95	72	18	100	Shortleaf	Medium
6	160	130	100	90	15	58	Shortleaf	High
7	80	80	22	90	4	9	Shortleaf	Low
Total	930	700	647	652	94	402		
$\bar{x}$	132.9	100	92.4	93.1	13.4	57.4		

a/ Rating determined using Forest Service Handbook 2409.21d R8, Kisatiche National Forest Supplement No. 7.

Table 8. SPB hazard rating summary for infestation locations on the Yellowpine Ranger District of the Sabine National Forest, National Forests in Texas.

Spot No.	Total Basal Area	Pine Basal Area	Total Tree Height	Site Index	Diameter (in.)	Age	Predominant Tree Species	SPB Hazard Rating[a/]
1	90	90	90	80	17	84	Loblolly	Medium
2	60	60	90	85	13	62	Loblolly	Low
3	140	110	95	95	15	53	Loblolly	High
4	120	60	85	105	16	64	Loblolly	Low
5	120	40	75	75	17	51	Loblolly	Low
6	110	80	70	77	12	42	Loblolly	Medium
7	60	50	80	73	15	64	Loblolly	Low
8	150	120	90	87	13	55	Loblolly	High
9	130	90	80	80	13	50	Loblolly	Medium
10	120	120	70	63	12	70	Loblolly	High
Total	1100	820	825	820	143	595		
x	110	82	82.5	82	14.3	59.5		

a/ Rating determined using Forest Service Handbook 2409.21d R8, Kisatchie National Forest Supplement No. 7.

Table 9. SPB hazard rating summary for infestation locations on the Neches Ranger District of the Davy Crockett National Forest, National Forests in Texas.

Spot No.	Total Basal Area	Pine Basal Area	Total Tree Height	Site Index	Diameter (in.)	Age	Predominant Tree Species	SPB Hazard Rating[a/]
1	150	100	95	84	14	75	Loblolly	High
2	140	90	110	91	16	75	Shortleaf	Medium
3	130	100	110	97	16	75	Loblolly	Medium
4	120	70	105	87	18	75	Shortleaf	Medium
5	100	90	100	81	16	82	Shortleaf	Medium
6	150	140	105	93	14	77	Loblolly	High
7	130	110	100	93	12	63	Loblolly	High
8	110	90	90	88	12	53	Shortleaf	Medium
9	120	100	80	74	10	58	Shortleaf	High
Total	1150	890	895	788	128	633		
$\bar{X}$	127.77	98.88	99.44	87.55	14.22	70.33		

a/ Rating determined using Forest Service Handbook 2409.21d R8, Kisatchie National Forest Supplement No. 7.

Table 10. SPB hazard rating summary for infestation locations on the Trinity Ranger District of the Davy Crockett National Forest, National Forests in Texas.

Spot No.	Total Basal Area	Pine Basal Area	Total Tree Height	Site Index	Diameter (in.)	Age	Predominant Tree Species	SPB Hazard Rating[a/]
1	110	90	90	89	14	52	Loblolly	Medium
2	120	100	65	110	10	21	Loblolly	Medium
3	140	100	85	77	14	70	Shortleaf	High
4	140	140	30	70	6	17	Loblolly	Low
5	150	120	50	110	8	17	Loblolly	Low
6	160	110	110	95	22	97	Loblolly	High
7	150	100	110	98	24	70	Loblolly	Medium
8	140	120	100	87	20	88	Loblolly	High
9	150	110	90	78	16	88	Shortleaf	High
10	100	80	100	87	15	88	Loblolly	Medium
Total	1360	1070	830	901	149	608		
$\bar{x}$	136	107	83	90.1	14.9	60.8		

a/ Rating determined using Forest Service Handbook 2409.21d R8, Kisatchie National Forest Supplement No. 7.

Table 11. SPB hazard rating summary for infestation locations on the San Jacinto Ranger District of the Sam Houston National Forest, National Forests in Texas.

Spot No.	Total Basal Area	Pine Basal Area	Total Tree Height	Site Index	Diameter (in.)	Age	Predominant Tree Species	SPB Hazard Rating[a]
1	90	90	75	90	10	35	Loblolly	Medium
2	120	100	115	100	18	85	Loblolly	High
3	130	90	70	70	14	50	Loblolly	Medium
4	190	110	75	75	15	50	Loblolly	High
5	90	40	50	70	14	29	Loblolly	Low
6	150	120	70	70	14	61	Loblolly	High
7	160	100	85	80	15	55	Loblolly	High
8	130	100	80	80	14	55	Loblolly	High
9	160	100	80	80	14	50	Loblolly	High
10	140	110	90	85	17	60	Loblolly	High
Total	1360	960	790	800	145	530		
x̄	136	96	79	80	14.5	53		

[a] Rating determined using Forest Service Handbook 2409.21d R8, Kisatchie National Forest Supplement No. 7.

Table 12. SPB hazard rating summary for infestation locations on the Raven Ranger District of the Sam Houston National Forest, National Forests in Texas.

Spot No.	Total Basal Area	Pine Basal Area	Total Tree Height	Site Index	Diameter (in.)	Age	Predominant Tree Species	SPB Hazard Rating[a]
1	140	130	85	95	12	42	Loblolly	High
2	140	120	100	87	17	76	Loblolly	High
3	160	130	110	102	18	65	Loblolly	High
4	160	140	110	93	14	76	Loblolly	High
5	120	100	110	97	16	85	Loblolly	High
6	150	150	40	55	6	29	Loblolly	Medium
7	150	140	100	94	14	60	Loblolly	High
8	160	120	110	97	18	75	Loblolly	High
9	130	120	115	103	20	75	Loblolly	High
10	150	120	90	90	12	50	Loblolly	High
Total	1460	1270	970	913	147	633		
$\bar{x}$	146	127	97	91.3	14.7	63.3		

[a] Rating determined using Forest Service Handbook 2409.21d R8, Kisatchie National Forest Supplement No. 7.

RECOMMENDATIONS

Based on the size and number of spots, and the predicted and observed SPB spot growth, FPM anticipates increased beetle losses next year on the National Forests in Texas. The present level of SPB activity on the Yellowpine, Angelina, Neches, Trinity, Raven and San Jacinto Ranger Districts indicate an SPB suppression project for these districts is justified.

Appendix II describes a complete list of control alternatives for SPB spots.

PRECAUTIONARY STATEMENT

Pesticides used improperly can be injurious to man, animals, and plants. Follow the directions and heed all precautions on the labels.

Store pesticides in their original containers under lock and key out of reach of children and animals, and away from food and feed.

Apply pesticides so that they do not endanger humans, livestock, crops, beneficial insects, fish and wildlife. Do not apply pesticides when there is danger of drift, when honey bees or other pollinating insects are visiting plants, or in ways that may contaminate water or leave illegal residues.

Avoid prolonged inhalation of pesticide sprays or dusts; wear appropriate protective clothing.

If your hands become contaminated with a pesticide, wash them immediately with soap and water. In case a pesticide is swallowed or gets in the eyes, follow the first aid treatment given on the label and get prompt medical attention. If a pesticide is spilled on your skin or clothing, remove the clothing immediately and wash skin thoroughly. After handling or spraying pesticides, do not eat or drink until you have washed with soap and water.

Do not clean spray equipment or dump excess spray material near ponds, streams, or wells. Because it is difficult to remove all traces of herbicide from equipment, do not use the same equipment for insecticides or fungicides that you used for herbicides.

Dispose of empty pesticide containers promptly. Have them buried at a sanitary landfill dump, or crush and bury them in a level, isolated place.

NOTE: Some states have restrictions on the use of certain pesticides. Check your state and local regulations. Also, because registrations of pesticides are under constant review by the U.S. Environmental Protection Agency, consult your county agent, state extension specialist or FPM to be sure it is still registered for the intended use. For further information or assistance, contact Forest Pest Management, Alexandria Field Office, Pineville, La., 71360, (Telephone: FTS 497-7280, or Commercial 318/473-7280).

REFERENCES

Lorio, P. L., Jr.; Sommers, R. A. Use of available resource data to rate stands for southern pine beetle risk. In: Hazard rating systems in forest insect pest management: Symposium proceedings. Gen. Tech. Rep. WO-27. Washington, D.C.: U.S. Department of Agriculture, Forest Service; 1981: 75-78.

Swain, K. M.; Remion, M. C. Southern Pine Beetle Handbook: Direct control methods for the southern pine beetle. U.S. Department of Agriculture Handbook No. 575. Washington, D.C.: U.S. Department of Agriculture, Combined Forest Pest Research and Development Program; 1980. 15p.

Thatcher, R. C.; Barry, P. J. Southern Pine Beetle, Forest Insect and Disease Leaflet #49. U.S.Department of Agriculture, Forest Service. October 1982. 7p.

APPENDIX I

Southern Pine Beetle Economic Evaluation
for the National Forests in Texas
at 4% Discount Rate

WITHOUT A PROJECT[1/]

AGE	HARV OBJ.	VOLUME LOST (MCF)	SPOT GROWTH RATE	VOLUME THREAT (MCF)	GROWTH RATE (%)	AGE AT HARV.	VOLUME AT HARVEST (MCF)	PRICE AT HARV.	VALUE AT HARVEST	PRESENT VALUE
30	S/I	58	4.51	262	2.7	40	351	$ 1243	$ 436710	$ 283678
30	S/F	118	4.51	531	1.4	70	940	$ 2252	$ 2116423	$ 423873
50	S/F	126	2.02	254	.7	70	292	$ 1516	$ 443277	$ 194525
60	S/F	815	4.57	3723	.5	70	3926	$ 1243	$ 4881855	$ 3171160
70	S/F	1636	4.65	7598	.4	70	7626	$ 1020	$ 7778815	$ 7479630
TOTAL		2753		12368			13136		$ 15657080	$ 11552866

VALUE OF THE VOLUME NOT SALVAGED (LOST) $ 894660

TOTAL VALUE LOST $ 12447526

WITH A PROJECT[2/]

AGE	HARV OBJ.	VOLUME LOST (MCF)	SPOT GROWTH RATE	VOLUME THREAT (MCF)	GROWTH RATE (%)	AGE AT HARV.	VOLUME AT HARVEST (MCF)	PRICE AT HARV.	VALUE AT HARVEST	PRESENT VALUE
30	S/I	19	4.51	87	2.7	40	117	$ 1243	$ 145570	$ 94559
30	S/F	39	4.51	177	1.4	70	313	$ 2252	$ 705474	$ 141291
50	S/F	42	2.02	85	.7	70	97	$ 1516	$ 147759	$ 64842
60	S/F	272	4.57	1241	.5	70	1309	$ 1243	$ 1627285	$ 1057053
70	S/F	545	4.65	2533	.4	70	2542	$ 1020	$ 2592938	$ 2493210
TOTAL		918		4123			4379		$ 5219027	$ 3850955

VALUE OF THE VOLUME NOT SALVAGED (LOST) $ 298220

TOTAL VALUE LOST $ 4149175

PROJECT BENEFITS:	8298351
TOTAL PROJECT COST:	530950[3/]
NET PRESENT VALUE:	7762401
BENEFIT COST RATIO:	15.48
INTERNAL RATE OF RETURN:	> 400%
COMPOSITE RATE OF RETURN:	11.19%
TARGETS	
VOLUME REMOVED:	2753
VOLUME PROTECTED:	8245

1/ Assume a 25% salvage level
2/ Assume a 75% salvage level
3/ Includes: Salvage sale $ 25,000
FPM funds $505,150

Southern Pine Beetle Economic Evaluation
for the National Forests in Texas
at 10% Discount Rate

WITHOUT A PROJECT[1/]

AGE	HARV OBJ.	VOLUME LOST (MCF)	SPOT GROWTH RATE	VOLUME THREAT (MCF)	GROWTH RATE (%)	AGE AT HARV.	VOLUME AT HARVEST (MCF)	PRICE AT HARV.	VALUE AT HARVEST	PRESENT VALUE
30	S/I	58	4.51	262	2.7	40	351	$ 1243	$ 436710	$ 153064
30	S/F	118	4.51	531	1.4	70	940	$ 2252	$ 2116423	$ 42511
50	S/F	126	2.02	254	.7	70	292	$ 1516	$ 443277	$ 59900
60	S/F	815	4.57	3723	.5	70	3926	$ 1243	$ 4881855	$ 1711061
70	S/F	1636	4.65	7598	.4	70	7626	$ 1020	$ 7778815	$ 7071650
TOTAL		2753		12368			13136		$ 15657080	$ 9038186

VALUE OF THE VOLUME NOT SALVAGED (LOST) $ 894660

TOTAL VALUE LOST $ 9932846

WITH A PROJECT[2/]

AGE	HARV OBJ.	VOLUME LOST (MCF)	SPOT GROWTH RATE	VOLUME THREAT (MCF)	GROWTH RATE (%)	AGE AT HARV.	VOLUME AT HARVEST (MCF)	PRICE AT HARV.	VALUE AT HARVEST	PRESENT VALUE
30	S/I	19	4.51	87	2.7	40	117	$ 1243	$ 145570	$ 51021
30	S/F	39	4.51	177	1.4	70	313	$ 2252	$ 705474	$ 14170
50	S/F	42	2.02	85	.7	70	97	$ 1516	$ 147759	$ 19967
30	S/I	19	4.51	87	2.7	40	117	$ 1243	$ 145570	$ 51021
30	S/F	39	4.51	177	1.4	70	313	$ 2252	$ 705474	$ 14170
50	S/F	42	2.02	85	.7	70	97	$ 1516	$ 147759	$ 19967
60	S/F	272	4.57	1241	.5	70	1309	$ 1243	$ 1627285	$ 570354
70	S/F	545	4.65	2533	.4	70	2542	$ 1020	$ 2592938	$ 2357217
TOTAL		918		4123			4379		$ 5219027	$ 3012729

VALUE OF THE VOLUME NOT SALVAGED (LOST) $ 298220

TOTAL VALUE LOST $ 3310949

PROJECT BENEFITS:	6621897
TOTAL PROJECT COST:	530950[3/]
NET PRESENT VALUE:	6085947
BENEFIT COST RATIO:	12.36
INTERNAL RATE OF RETURN:	> 400%
COMPOSITE RATE OF RETURN:	16.96%
TARGETS	
VOLUME REMOVED:	2753
VOLUME PROTECTED:	8245

1/ Assume a 25% salvage level
2/ Assume a 75% salvage level
3/ Includes: Salvage sale $ 25,000
FPM funds $505,150

APPENDIX II

ALTERNATIVES FOR SOUTHERN PINE BEETLE CONTROL

Five alternatives are recommended for southern pine beetle control. The following discussion briefly outlines these alternatives (Swain & Remion 1980). For a more detailed description on conducting control procedures in a southern pine beetle suppression project refer to the Project Control Plan or to the southern pine beetle handbook series (Agric. Hanb. Nos. 558, 560, 575, 576).

Alternative 1 - No Action. SPB populations increase periodically. Under this alternative, it is expected that the present SPB infestation would continue to spread and destroy many of the aesthetic characteristics. This may occur over one to several years. If unchecked, the beetles will create large openings of dead snags and scrub brush and greatly reduce the overall pine component. Infestations will likely spread to adjacent areas of both public and private land or serve as epicenters for population expansion. Liabilities for damage could be involved.

Standing snags create a safety hazard to visitors in the area. Violations of the Texas Forest Pest Law may occur.

Alternative 2 - Removal of infested trees and buffer strip of uninfested trees by commercial sales. When infested and buffer strip trees of merchantable size are accessible (skidding distance is a quarter of a mile or less to an existing road), they could be removed by commercial sale. Logging of the infested material should begin immediately. Where needed, a 40 to 125 foot buffer strip will be marked and cut adjacent to and ahead of the most recently infested trees. The order of priority for removing infested timber will be as follows:

a. Trees in the buffer zone. A 40 to 125 foot buffer strip of uninfested green trees around the head of the spot is recommended for removal to minimize reinfestations and to disperse the beetles. The width of buffer zone should be approximately equal to the height of the stand being treated. With weekly monitoring of the spot after control, the buffer strip could be made even smaller or eliminated.

b. Infested green trees. This removes the SPB pheromone source and potential brood.

c. Faders. This removes potential brood.

d. Red-topped. These trees contain living brood during fall and winter and should be removed. It is not necessary to remove these trees during the warmer summer months when developmental rates are much faster.

Alternative 3 - Chemical Control. Chemicals recommended for SPB are Lindane, Dursban, and Sumithion. Formulation mixtures are shown on labels. Cut, limb, buck all infested trees into workable lengths. Spray the infested bark surface to the point of run-off. A hand compressed air sprayer is an ideal applicator. Infested logs should be turned three times to insure complete treatment of infested bark. Spray cut stumps and bark removed by woodpeckers.

The order of priority for cutting and spraying infested trees in large spots is the same as stated in Alternative 2. Cutting a buffer strip is not recommended. To reduce the possibility of "breakouts", every effort will be made to locate and treat all green infested trees during the chemical control operation.

Trees from which the brood have emerged will not be sprayed so that natural enemies of the SPB can complete their development.

Alternative 4 - Cut-and-Leave. Cut-and-leave is designed to disrupt spot growth in small to medium-sized spots (less than 50 active trees) by dispersing emerging beetles. The following procedure is to be followed when cut-and-leave is applied.

(1) Identify all active trees within the spot.

(2) Fell all active trees toward the center of the spot.

(3) Fell a horseshoe-shaped buffer strip of green, uninfested trees around the most recently attacked trees at the head of the spot and leave them lying on the ground with crowns pointed toward the center of the spot. The buffer should be no wider than the average height of the trees in the spot.

(4) Dead trees from which all SPB have emerged need not be felled. Cut-and-leave treatments, for best results, should be applied during the summer months only (June-October).

In spots > 50 active trees, where cut-and-leave is the only treatment option, cut-and-leave can be administered. Each spot treated must be checked at one week intervals for 4 weeks and treated again, if necessary.

(4) Alternative 5 - Pile-and-Burn. Felling, piling, and thoroughly burning the bark of infested trees is one of the oldest methods of controlling SPB. The entire bark surface must be thoroughly burned to insure effective control. The order of priority for cutting, piling and burning infested trees, particularly in large spots, is the same as stated above under removal of infested trees by commercial sale. Cutting a buffer strip is not recommended. To reduce the possibility of "breakouts", every effort will be made to locate and treat all green infested trees during the piling and

burning operation. Burning should not be done if it will result in soil erosion.

Alternative 6 - A combination of 2, 3, 4 & 5. This alternative covers all the situations and control measures to detect and control the SPB.